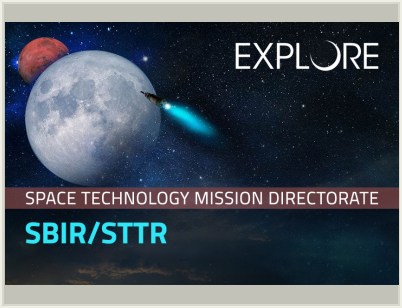
TORC-SP: High Torque, Low Jitter Scissored-Pair CMG Technology, Phase II

Completed Technology Project (2011 - 2013)

Project Introduction

NASA sees an increasing role in the near future for small satellites in the 5-100 kg size range. A potentially disruptive technology, small satellites are being eyed as platforms for the rapid demonstration of new technologies and important science missions. Currently, small satellite platforms struggle to balance the three critical tasks of collecting enough power, acquiring data and downlinking that data to ground stations in a way that maximizes mission return. For these small platforms, which usually do not benefit from steer-able solar arrays or gimbaled antennas and instruments, optimally balancing these three tasks strongly depends on the satellite's attitude control agility. Spacecraft agility has to do with rapid retargeting, fast transient settling and low jitter pointing control. Dr. Bong Wie, renowned spacecraft attitude control expert and Professor of Aerospace Engineering at Iowa State University, stated that ultimately the "measure of an agile satellite attitude control system is its ability to collect the maximum data from an area on the Earth that is rich in data-collection opportunities". A logical corollary following from this statement would be that to maximize satellite data-collection, system designers should look to increase the satellite's agility. Furthermore, in addition to data-collection, the other two critical tasks of power collection and data downlink are also maximized as agility is increased. Honeybee Robotics proposes to develop a low cost, high torque and low jitter satellite attitude control actuator derived from its Tiny Operationally Responsive CMG (TORC) design. This derivative product would combine two TORC units into a single scissored-pair configuration with SPA compatible interface. The result, a flight-certified TORC-SP, would be an actuator with the simple control interface of a reaction wheel that offers 1-2 orders of magnitude more torque per unit mass at drastically less power than a reaction wheel.



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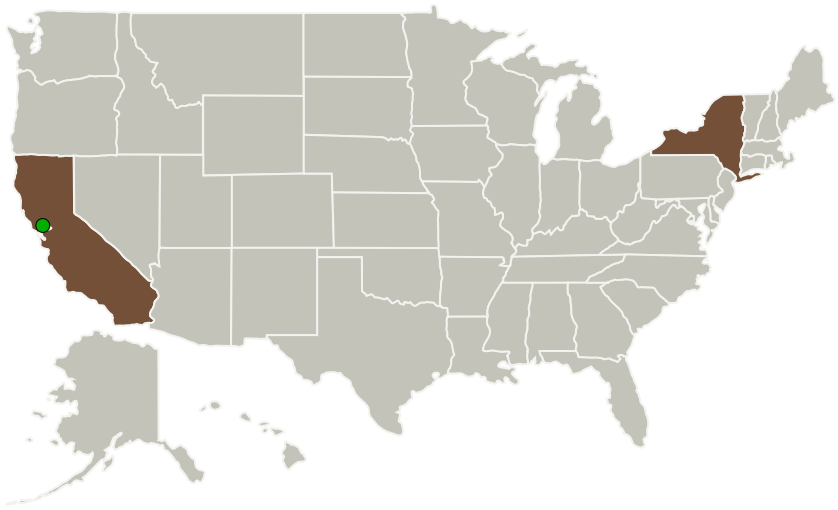
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Honeybee Robotics, Ltd.	Lead Organization	Industry	Pasadena, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	New York

Project Transitions

June 2011: Project Start

September 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140586)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Honeybee Robotics, Ltd.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

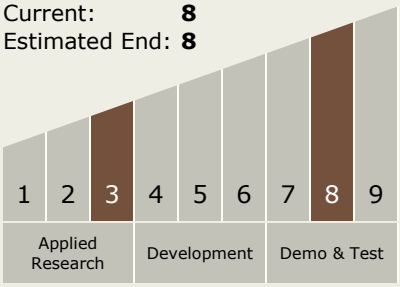
Carlos Torrez

Principal Investigator:

Kiel R Davis

Technology Maturity (TRL)

Start: **3**
Current: **8**
Estimated End: **8**



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Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.2 Reasoning and Acting
    - TX10.2.6 Fault Response

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System